



INSTITUTE FOR DEFENSE ANALYSES

**Putting the Puzzle Together: A Proposal
for a Comprehensive Study of the
Military Medical Management
of Nuclear Casualties**

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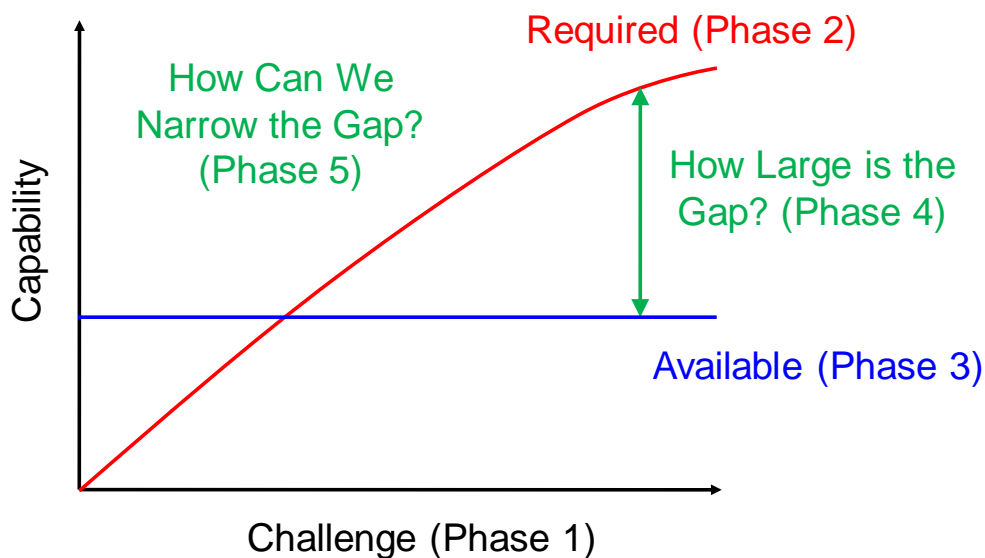
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Executive Summary

The Army Office of the Surgeon General (OTSG) requested that IDA develop a plan to evaluate the capabilities of the U.S. Army Medical Department to meet the medical management requirements that would result from an adversary use of a nuclear weapon against U.S. military forces in a foreign theater of war. Early in the development of the study plan, it became apparent that the Army was only one of many parties with interest in and responsibility for issues related to the medical management of nuclear casualties. In response, IDA expanded the study concept to consider the response roles across the entire Department of Defense (DOD). This document provides the resulting IDA study plan. The proposed study would provide policy makers and planners with recommendations to address shortfalls and utilize the optimum strategies for the management of nuclear casualties. As shown in the figure below, the study concept is to identify both the required and available capabilities to manage the patient stream resulting from a nuclear attack, to determine at what point the required capabilities exceed those available, and to quantify and narrow the gap between the two cases. Capability includes both medical resources (e.g., supplies, equipment, and personnel) and the processes by which those resources are brought to bear. The study plan considers medical management capabilities to include, at minimum, those needed for the collection, evacuation, decontamination, triage, stabilization, and treatment of casualties, as well as the associated medical logistics.



Nuclear Medical Management Assessment Concept

Although it is generally presumed that the required capabilities for managing nuclear casualties will far exceed those available in the aftermath of a nuclear detonation, the specific demands on the U.S. military medical system and the extent to which requirements would exceed its capabilities are currently unknown. The proposed study intends to address a number of issues surrounding the military medical response to a nuclear detonation that are currently insufficiently understood. Among these are the number and types of expected casualties, the medical management requirements for all types of injuries over all time points, the available capabilities to manage nuclear casualties, the point at which available capabilities are exceeded, and the most effective concept of operations following a nuclear detonation.

The identification, coordination, and integration of issues identified in the study, and the results of the subsequent analyses, should result in a document of common usage and specific recommendations which will allow the Department of Defense (DOD) to:

- Better inform medical materiel acquisition decisions such as prepositioning of medical countermeasures, medical resources, equipment, and supplies;
- Support contingency planning for scenarios with adversary use of nuclear weapons;
- Develop concepts of operation to improve efficiency and effectiveness of existing capabilities;
- Propose force structure changes appropriate to enhancing nuclear medical management capabilities within a robust military health care system; and
- Identify gaps and shortfalls in capabilities amenable to resolution within the doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) rubric.

Administration

This study is conceived as an analytic effort chartered within the DOD to answer questions associated with the management of nuclear casualties resulting from military action and managed within the military health care system. The Institute for Defense Analyses (IDA) recommends that the study be administered by an organization with the authority to review and recommend changes to policies and doctrine at level of the Services, Joint Staff and OSD. The policies and doctrine encompass both medical and nuclear response. This organization should issue a charter directing the initiation of an independent review of medical readiness planning and, where necessary, develop recommendations for corrective action. The charter should direct the appointment of a Study Director, a General Officer Steering Committee (GOSC), and a Working Group (WG).

The Study Director should be a senior officer (O-6 or above). The Study Director shall report to, and operate under the guidance of, a GOSC (such as the Force Health Protection

Council). The Study Director shall be assisted in the management of the study by a WG, which shall provide oversight and direction as it addresses specific questions and analytic issues. Interested parties may be invited to participate as observers within the WG, but shall have no authority to vote on decisions or assign study tasks within the WG. IDA's recommendations for the makeup of the GOSC and the WG, as well as suggestions for interested parties to be invited to observe the study, are included in the body of this document.

The Study Director shall select and task one or more study performers, responsible for integrating and conducting the analytic functions of the study, for documenting the work of the GOSC and the WG, and for providing administrative support to the study as required and appropriate.

Study Plan

The proposed plan divides the study into phases, each of which has a specific intermediate objective that supports the core study objectives.

Phase 0 - Definition and Implementation of the Study Parameters: Establish the scope of the study, to include the range of issues to be considered outside the realm of military medical management. Define the baseline scenario and associated parameters of interest, the considered casualty types, the range of variations, and the measures of effectiveness necessary to both quantify capability shortfalls and evaluate possible remedies. Identify and select appropriate tools and methodologies (for example, Hazard Prediction and Assessment Capability [HPAC], Nuclear, Biological, and Chemical Casualty and Resource Estimation Support Tool [NBC CREST], or NucFast) for use in the conduct of the study, and develop a strategy to overcome existing limitations of those tools and methodologies. Determine data requirements and develop a data collection plan to support each subsequent phase of the study.

Phase 1 - Determination of Casualty Stream: Using appropriate nuclear effects and population models as identified in Phase 0, estimate expected casualties for the baseline scenario and various excursions. This estimate would include the number and locations of casualties and the distribution of injuries by type. It would also include an estimate of the disposition of those casualties over time, to include the extent to which their condition would degrade prior to the initiation of treatment.

Phase 2 - Estimation of Required Medical Management Capabilities: Using the Common User Database (CUD) (or an equivalent resource) supplemented by subject matter experts, define the capabilities required to collect, evacuate, decontaminate, triage, stabilize, and treat each type of nuclear casualty across all levels of military medical treatment, from initial reception into the military health care system through the point of patient recovery, including the associated medical logistics. Stratify casualties according to the medical capabilities needed to manage nuclear casualties.

Phase 3 - Definition of Available Medical Management Capabilities: From the current deployment of military medical management capabilities and facilities, identify and quantify the resources that would be available to address the medical management requirements for nuclear casualties. Include all levels of the military health care system, from initial reception through patient recovery. Response times for individual assets will need to be defined (perhaps as a function of the unit missions, the available mobility or evacuation resources, and the anticipated infrastructure damage). This phase of the study will also identify the operational concepts for the delivery of medical care to the nuclear casualties.

Phase 4 - Identification of Medical Management Shortfalls: Identify and quantify the shortfalls between resources required and resources available to manage nuclear casualties.

Phase 5 - Recommendations for Remediation of Medical Shortfalls: Identify alternatives to the existing military health care system to remedy the shortfalls between requirements and available capabilities to medically manage nuclear casualties. Recommend the optimum strategies for the management of nuclear casualties within the proposed revisions to the military health care system.

Schedule

This study can be performed in as little as three years, by overlapping the efforts for multiple phases. Phases 1–3 can be executed concurrently within the first eighteen months of the study (with some interdependence of the effort from one phase on the products of another). Phases 4–5 can be executed consecutively within the subsequent eighteen months of the study.

- **Phase 0** – Months 1–3 of the study
- **Phase 1** – Months 3–18 of the study
- **Phase 2** – Months 3–18 of the study
- **Phase 3** – Months 3–20 of the study
- **Phase 4** – Months 19–27 of the study
- **Phase 5** – Months 28–36 of the study

Products

It is anticipated that each phase (and in most cases, each milestone) would result in a publication or analytical tool as a product. Among these, the primary products are:

- “Report on the Expected Number and Types of Military Nuclear Casualties”
- “Report of Treatment Requirements from Day 1 through Patient Recovery Following a Nuclear Detonation”
- “Integrated U.S. Military Nuclear Casualty Medical Management Capability Matrix”

- “Report on the Nonmedical Support Required for the Medical Management of Nuclear Casualties”
- “Report on a Strategy for the Optimization of Medical Management of Nuclear Casualties with the U.S. Military Health Care System”

The final product of this study is a report on the “Recommendation on Changes in the Military Health Care System to Address Shortfalls in the Medical Management of U.S. Military Nuclear Casualties.”

Resources

This study is estimated to cost \$4.9M over three years of effort. By year of effort, this is:

- Year 1 \$2.3M
- Year 2 \$1.6M
- Year 3 \$1.0M

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1. Background and Scope

Since 1994, the Institute for Defense Analyses (IDA) has supported the United States Army Office of the Surgeon General (OTSG) in the Medical Chemical, Biological, Radiological, and Nuclear (CBRN) Defense Planning and Response Project. The objective of the project is to ensure that the U.S. military medical community can successfully fulfill its missions in a CBRN environment. In Fiscal Year (FY) 2011, OTSG requested that IDA develop a plan to evaluate the capabilities of the U.S. Army Medical Department to meet the medical management requirements that would result from an adversary use of a nuclear weapon against U.S. military forces in a foreign theater of war. This document provides the resulting IDA study plan.

While the potential severity of nuclear attacks is widely acknowledged, to date no comprehensive analysis has been conducted to define the specific scope and complexity of the required medical response or to identify shortfalls in capability. The proposed study intends to address a number of issues surrounding the military medical response to a nuclear detonation that are currently insufficiently understood. Among these are the number and types of expected casualties, the medical management requirements for all types of injuries over all time points, the available capabilities to manage nuclear casualties, the point at which available capabilities are exceeded, and the most effective concept of operations (CONOPs) for managing patients.

Early in the development of the study plan, it became apparent that the Army was only one of many parties with interest in and responsibility for issues related to the medical management of nuclear casualties. In response, IDA expanded the study concept to consider the response roles across the entire Department of Defense (DOD), and OTSG established an interagency coordination and review group to advise IDA in the development of the study plan. This group was comprised of action officer level representatives from the Service Surgeons General, the Assistant Secretary of Defense for Health Affairs, the Joint Staff, and the Defense Threat Reduction Agency. The study plan described in this document reflects ideas, comments, and concerns expressed in the course of discussions with this group.

Casualties resulting from the detonation of a nuclear weapon pose a unique set of challenges for medical management. These casualties are likely to differ both quantitatively and qualitatively from those recently experienced in conventional conflict. Even very small nuclear detonations can generate several thousand casualties, with extremely high rates of casualties occurring within the prompt effects range of the blast. While the prevalent trauma and burn injuries seen among nuclear casualties are also common among conventional casualties, in nuclear casualties treatment is complicated by radiation exposure. A number of additional factors

may complicate the medical response following a nuclear detonation, and add complexity to the analysis of requirements and capabilities. The operating environment in which nuclear casualties are managed is complicated by the physical effects of the blast. Debris, fires, disruptions to power and water supplies, damage to roads and rail lines, residual radioactivity, etc. may be widespread and make it difficult to bring patients and care together. The use of movement controls (instructions to shelter in place, protective action guidelines, evacuation restrictions) may enhance or hinder the response. Responders will need to deal with obstacles such as infrastructure damage, the effects of the electromagnetic pulse, patients who are internally and externally contaminated with radiation, casualties whose irradiation complicates the management of burn or blast trauma (combined injury casualties), psychological casualties, contaminated remains, and the impact of medical management requirements on battlefield operations.

The study plan as written is limited in scope, designed to focus on issues within the purview of its current sponsors and the members of the interagency coordination group. Even so, this group of individuals collectively recognized that the medical management of nuclear casualties would not occur in a vacuum, and that any nuclear detonation would create issues and problems that could not be addressed within the military medical community alone. These include interactions between the U.S. military, its allies, and host nation governments; interactions between the U.S. military and other departments of the U.S. government, such as the Department of State (DOS); and interactions between the military medical assets and other component parts of the U.S. military force. At present, the study would make assumptions about the nature of these interactions. However, as the study progresses from concept to execution, the focus of the work may shift to include greater emphasis on analysis of issues of this type.

OTSG requested that the study plan use a pre-hostility scenario involving a singular nuclear detonation, and this request was reiterated by members of the interagency coordination group. Any hostile detonation of a nuclear weapon would likely mean conventional conflict is imminent if not already underway. However, management of nuclear casualties in the midst of an ongoing high-intensity conflict environment will be complicated in ways that are difficult to comprehend. For this reason, the study plan proposed in this document addresses a wide range of nuclear-specific issues, but assumes that both detonation and response occur in a pre-hostility environment. In this way, the already-complex analysis is not further challenged by assumptions related to an ongoing conventional campaign, such as the location, disposition and degradation of friendly and enemy forces, or by a competition for resources between various components of the U.S. military medical system as well as between the medical system and other elements of the military response.

Subsequent sections of this document contain the objectives and scope of the proposed study, the results of a supporting literature review, and the study plan itself. The proposed study would be conducted in six phases (0–5); for each phase, the plan describes issues, objectives, approach, milestones, timelines for the conduct of the phase, and associated level of effort. The study plan also includes an overarching schedule, a list of products, and a proposal for study

administration and charter. While the estimated costs, timelines, and level of effort reflect the analytic experience of IDA research staff, IDA developed the study plan recognizing that it may not be the organization tasked with integrating and conducting the analysis described therein.

2. Objectives

The broad objectives of this study are to assess the current capability of the U.S. military health care system to meet the medical management requirements resulting from the use of a nuclear weapon against U.S. military forces in a foreign theater of war and to provide recommendations to address shortfalls and implement improved strategies for the management of nuclear casualties.

The identification, coordination, and integration of issues identified in the study, and the results of the subsequent analyses, should result in a document of common usage and specific recommendations that will allow the DOD to:

- Better inform medical materiel acquisition decisions such as prepositioning of medical countermeasures, medical resources, equipment, and supplies;
- Support contingency planning for scenarios with adversary use of nuclear weapons;
- Develop concepts of operation to improve efficiency and effectiveness of existing capabilities;
- Propose force structure changes appropriate to enhancing nuclear medical management capabilities within a robust military health care system; and
- Identify gaps and shortfalls in capabilities amenable to resolution within the doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) rubric.

Figure 1 broadly illustrates IDA's concept of the objectives of the study and its basic components. Underlying OTSG's request to IDA is the assumption that a nuclear detonation will generate a mass casualty event—one where the requirements for casualty management exceed available capability. The first part of the study objective is to test that assumption and identify the circumstances in which it applies: would existing capabilities in fact be overwhelmed? How large is the gap between requirements and capabilities?

The second part of the study objective includes developing strategies for augmenting existing capabilities to better meet requirements. Before these strategies can be identified and assessed, however, the study must generate a detailed understanding of the medical requirements associated with nuclear detonations, the military medical capabilities that would be available to respond to those requirements, and the nature and magnitude of specific capability shortfalls.

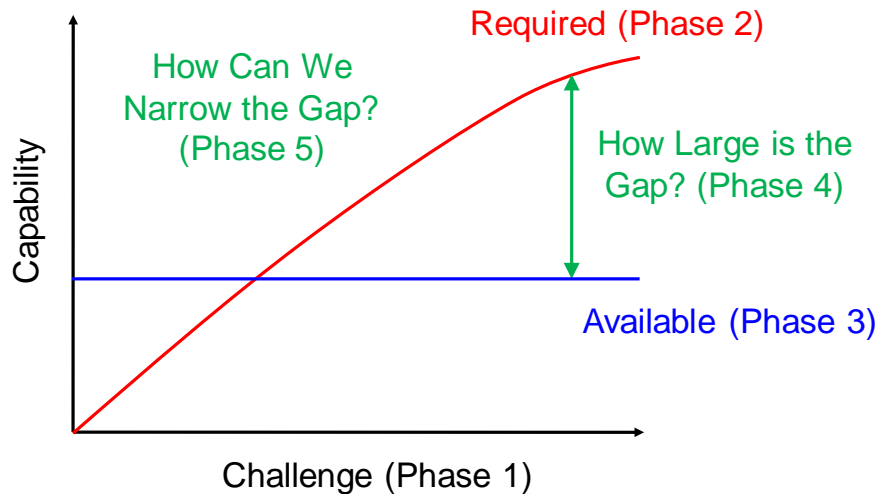


Figure 1. Nuclear Medical Management Assessment Concept

The challenge depicted in Figure 1 refers to the distribution of casualties entering the military medical system over time by number and type, and includes consideration of the operational constraints affecting the employment of medical capability. These constraints are scenario-dependent, and include such things as location of the detonation, the associated damage to infrastructure, disruption of power and water sources, and the need to balance competing requirements for medical capabilities. As discussed in Chapter 6 of this document, Phase 1 of the proposed study is to assess the challenge posed by the baseline scenario and excursions.

The medical management requirements associated with a given challenge are determined by the resources needed to treat individual casualties of each expected type. Total requirements are, in simple terms, the number of casualties of a given type (defined in Phase 1) times the sum of the requirements to treat a single casualty of a given type (defined in Phase 2). The proposed study estimates the medical management requirements over time in the baseline scenario and excursions.

Capability in this context is the delivery of medical care to military personnel to a defined standard of care. Capability includes both medical resources (e.g., supplies, equipment, and personnel) and the processes by which those resources are brought to bear. The study plan considers medical management capabilities to include, at minimum, those needed for the collection, evacuation, decontamination, triage, stabilization, and treatment of casualties, as well as the associated medical logistics. Phase 3 of the proposed study identifies the capabilities of the current U.S. military medical system to manage the baseline scenario and excursions.

Phases 4 and 5 of the proposed study use the assessments conducted in prior phases as inputs to the analysis required to meet the study objectives. Phase 4 identifies the nature and magnitude of expected shortfalls in capability, while Phase 5 identifies and evaluates strategies for meeting those shortfalls and makes recommendations for improving capabilities.

The use of nuclear weapons against U.S. forces abroad will undoubtedly result in large numbers of casualties among the host nation population; indeed, these casualties and their medical needs may dwarf those of the U.S. forces themselves. However, at this time the study plan focuses on the medical management requirements for defined beneficiaries of the military health care system: U.S. service members, their family members, U.S. government civilians, and contractor personnel living or working on U.S. military installations at the time of the attack. Similarly, the study currently restricts the consideration of capabilities to those available within the Department of Defense.

3. Literature Review

The U.S. military has been considering the effects of nuclear weapons for over sixty years. For the duration of the Cold War, military strategy incorporated both a faith in the deterrent effects of nuclear weapons across the spectrum of conflict and an expectation that any ground war with the Soviet Union in Central Europe might well involve widespread use of tactical nuclear weapons. Given this, it is reasonable to ask whether the questions raised in the currently proposed study have been addressed in the past, and if so, what lessons were learned that could be applied directly or by extension to meet the objectives of the proposed study. An extensive review of available literature (described below) revealed no prior studies had addressed the questions of nuclear casualty management at the level of detail required from this study.

To determine the degree to which the medical aspects of nuclear casualty management had been previously studied, IDA research staff worked closely with IDA's library manager and research librarians to conduct a comprehensive literature search and review. The library staff took a multi-pronged approach to their search. First, they contacted colleagues at various Army libraries to determine the extent to which historical collections had been digitized and incorporated into official document databases and to gather any information those colleagues might have that would usefully direct their search. Second, they conducted searches of the various document databases maintained by the Defense Technical Information Center (DTIC) using the keywords "nuclear" or "atomic" plus "medical" or "hospital." The term "battlefield" was further used to narrow the search results. Finally, they conducted a search of classified networks, such as the Joint Worldwide Intelligence Communications System (JWICS), to find any relevant documents retained within.

At the same time, IDA research staff polled colleagues at IDA, in the Army, and at national laboratories to identify either specific studies of interest or ideas for further searching. The two primary suggestions made in these discussions were to conduct a search of DTIC databases and to talk to individuals at various Army libraries; both of these avenues were already being pursued by IDA research librarians. In addition, IDA research staff spoke directly to library staff at Ft. Leavenworth, Kansas, the document repository location most frequently mentioned as a likely source for prior studies. Finally, IDA researchers conducted a search of open literature via EBSCOHost, a journal search service to which IDA subscribes, and via Google.

The IDA research librarians found approximately 100 relevant documents, of which a dozen touched on issues specifically related to nuclear casualty management. However, despite the comprehensiveness of the literature search, IDA staff found no evidence that the specific

objectives of the proposed study had been previously addressed. Conversations with colleagues at other libraries indicated that most historical research focused on optimizing the tactical advantages of offensive use of nuclear weapons and on maintaining operational tempo on a nuclear battlefield. While casualties were widely anticipated, most were generally expected to be prompt fatalities.

This conclusion is echoed in a series of articles recently published in a special issue of *Disaster Medicine and Public Health Preparedness* focused on response to a nuclear detonation in an American city:

There is a lack of understanding of what medical resources will be truly limited in relation to distance from the incident. This gap could begin to be addressed by a comprehensive modeling program that accounts for resource hierarchies, resource substitution, the cost of shortfalls, predicted evacuation times after the incident, and the ability to resupply and distribute resources from those already within the region.¹

The literature search and review was not without merit. Many of the articles and documents discuss in detail the operational environment—damage to infrastructure, ongoing hazards, psychological effects among the host nation population, etc.—expected in the aftermath of a nuclear detonation, and such factors will be important considerations when evaluating the unique constraints on delivering medical care to nuclear casualties. Others describe various triage schemes for nuclear casualties designed to optimize the use of scarce medical resources. Still others provide broader concepts for domestic nuclear response strategies that incorporate considerations of medical requirements. In sum, while there are no earlier studies directly addressing the questions raised in the present study, the context in which nuclear casualty management would occur and the associated issues have been well described.

¹ C. Norman Coleman et al., “Scarce Resources for Nuclear Detonation: Project Overview and Challenges,” *Disaster Medicine and Public Health Preparedness* 5 (2011): S15.

4. Administration

This study is conceived as an analytic effort chartered within the DOD to answer questions associated with the management of nuclear casualties resulting from military action and managed within the military health care system. The Institute for Defense Analyses (IDA) recommends that the study be administered by an organization with the authority to review and recommend changes to policies and doctrine at the level of the Services, Joint Staff and OSD. The policies and doctrine encompass both medical and nuclear response. This organization should issue a charter directing the initiation of an independent review of medical readiness planning and, where necessary, develop recommendations for corrective action. The charter should direct the appointment of a Study Director, a General Officer Steering Committee (GOSC), and a Working Group (WG).

The Study Director should be a senior officer (O-6 or above). The Study Director shall report to, and operate under the guidance of, a GOSC (such as the Force Health Protection Council). IDA recommends the GOSC include flag rank representatives from at least:

- The Director, J8
- The Assistant Secretary of Defense (Health Affairs)
- The Joint Staff Surgeon
- The Army Surgeon General
- The Surgeon General of the Navy
- The Air Force Surgeon General

The entity chartering this study should also consider whether other representatives, such as from U.S. Transportation Command (TRANSCOM) or specific regional combatant commands, should be included on the GOSC.

The Study Director shall be assisted in the management of the study by a WG. The WG shall provide oversight and direction as it addresses specific questions and analytic issues. IDA recommends that the WG consist of officers from the staffs of:

- The Office of the Assistant Secretary of Defense (Health Affairs)
- The Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs
- The Joint Requirements Office

- JCS J4 – Health Services Support
- The Office of the Army Surgeon General
- The Navy Bureau of Medicine
- The Marine Corps Medical Officer
- The Air Force Surgeon General
- Combatant Commands (COCOMs), including (as a minimum)
 - U.S. Central Command (CENTCOM)
 - U.S. European Command (EUCOM)
 - U.S. Pacific Command (PACOM)
- U.S. Transportation Command (TRANSCOM)
- Defense Medical Materiel Program Office (DMMPO)
- Uniformed Services University of the Health Sciences (USUHS)
- Armed Forces Radiobiology Research Institute (AFRRI)
- Defense Threat Reduction Agency (DTRA)
- Other DOD agencies or activities directly involved in the planning, preparation, and delivery of medical care for nuclear casualties

Interested parties may be invited to participate as observers within the WG, but shall have no authority to vote on decisions or assign study tasks within the WG. Suggestions for interested parties to be invited to observe the study include:

- Department of Health and Human Services
- Department of Homeland Security
- Department of Veterans' Affairs
- Department of State
- Department of Agriculture

The Study Director shall select and task one or more study performers, responsible for integrating and conducting the analytic functions of the study, for documenting the work of the GOSC and the WG, and for providing administrative support to the study as required and appropriate.

5. Charter

The study charter should be published by the J8, or some other DOD entity with the responsibility and authority to oversee the study and ensure the implementation of its recommendations. The study charter should provide specific charges to the Study Director and Working Group. It should direct the study to respond to specific questions regarding the U.S. military capability for managing nuclear casualties within the military health care system, as well as such additional questions as are identified during the study process. IDA suggests several specific charges for the charter:²

Charge 1. Initiate an independent review of medical readiness planning for nuclear casualty management. As a minimum, the review should cover medical command and control, medical evacuation, the adequacy of medical planning and communications, casualty estimation, arrangements with friendly nations for hospitalization and evacuation support, and planning for medical responses. It should also cover any additional matters of significance related to medical readiness planning for nuclear casualty management that may become evident during the overall review.

Charge 2. Determine what must be done to achieve and maintain medical readiness for nuclear casualty management. To do so, the WG must find the answers to the enclosed questions and to such additional questions as may be identified. But that alone will not suffice: the WG is tasked not only to make determinations of fact and to assess the performance of the existing system but also, to the extent deemed necessary, to provide a prescription for improving medical readiness for nuclear casualty management. In pursuing that goal, the WG must become intimately knowledgeable about the medical plans that have been developed for the support of U.S. forces. This will require a detailed review of the medical plans that have been established for the support of U.S. forces, including the medical annexes to any pertinent operation plans.

Charge 3. Ultimately, planning is not enough. The best medical plans, alone, cannot stop the suffering of a nuclear casualty. To be valid, plans must be supported by the capabilities required for their execution. The final report should address the implications of the estimates of those capabilities to support the execution of plans for medical management of nuclear casualties.

² Adapted from "Review of U.S. European Command Medical Readiness Planning, Charge to Review Group," Mafer, William (ASD-HA), 6 February 1984.

IDA proposes that the study, at minimum, address the following questions from the outset. The study charter should give the Study Director the authority to direct additional questions as appropriate during any phase of the study.

1. Given that a nuclear weapon is detonated in the vicinity of a U.S. military installation, what is a credible casualty estimate (or range of estimates), including the number, types, severity, and time of occurrence? (Phase 1)
2. How would the disposition of casualties be expected to change over time? To what extent would their condition degrade should there be delays in the initiation of treatment? (Phase 1)
3. Which populations at risk in the postulated scenario must be considered when estimating U.S. military medical response requirements? (Phase 1)
4. How sensitive is the casualty estimate to variation in the threat parameters such as yield, height of burst, location, and meteorology? (Phase 1)
5. What capabilities are required to collect, decontaminate, triage, stabilize, evacuate, and treat each type of nuclear casualty across all levels of military medical management, from initial reception into the military health care system through the point of patient recovery? (Phase 2)
6. What transportation, personnel, equipment, and materiel assets are needed to support required military medical management capabilities? (Phase 2)
7. What capabilities exist within the U.S. military to provide medical management of nuclear casualties? How are they stratified by level of command? How rapidly can they be brought to bear in the baseline scenario and excursions? How would the delivery of existing capability be limited by the operational constraints in the scenario? (Phase 3)
8. To what extent do available capabilities vary by theater of operations? (Phase 3)
9. Given the expected numbers and types of nuclear casualties, will there be shortfalls in available capabilities? What is the nature and extent of those shortfalls? What is the impact of shortfalls on the outcome of treatment for the population of expected casualties? (Phase 4)
10. What changes could be made to the military health care system to remedy identified shortfalls? Can resources be reallocated to make capabilities more efficient? Can capabilities be readily augmented? Can revisions to concepts of operation for use of various capabilities improve effectiveness? (Phase 5)
11. Which strategies for improved medical management would be most effective? What changes to the military medical management capabilities should be made to implement those strategies? (Phase 5)

12. What changes need to be made to current doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) to support recommended improvements in capabilities for the military medical management of nuclear casualties? (Phase 5)

6. Study Plan

The proposed plan divides the study into six phases, each of which has a specific intermediate objective that supports the core study objectives. The phases are delineated below and described in detail in the sections that follow.

Phase 0: Establish the scope of the study, to include the range of issues to be considered outside the realm of military medical management. Define the baseline scenario and associated parameters of interest, the considered casualty types, the range of variations, and the measures of effectiveness necessary to both quantify capability shortfalls and evaluate possible remedies. Identify and select appropriate tools and methodologies (for example, Hazard Prediction and Assessment Capability [HPAC], Nuclear, Biological, and Chemical Casualty and Resource Estimation Support Tool [NBC CREST], or NucFast) for use in the conduct of the study, and develop a strategy to overcome existing limitations of those tools and methodologies. Determine data requirements and develop a data collection plan to support each subsequent phase of the study.

Phase 1: Using appropriate nuclear effects and population models as identified in Phase 0, estimate expected casualties for the baseline scenario and various excursions. This estimate would include the number and locations of casualties and the distribution of injuries by type. It would also include an estimate of the disposition of those casualties over time, to include the extent to which their condition would degrade prior to the initiation of treatment.

Phase 2: Using the Common User Database (CUD) (or an equivalent resource) supplemented by subject matter experts, define the capabilities required to collect, evacuate, decontaminate, triage, stabilize, and treat each type of nuclear casualty across all levels of military medical treatment, from initial reception into the military health care system through the point of patient recovery, including the associated medical logistics. Stratify casualties according to the medical capabilities needed to manage nuclear casualties.

Phase 3: From the current deployment of military medical management capabilities and facilities, identify and quantify the resources that would be available to address the medical management requirements for nuclear casualties. Include all levels of the military health care system, from initial reception through patient recovery. Response times for individual assets will need to be defined (perhaps as a function of the unit missions, the available mobility or evacuation resources, and the anticipated infrastructure damage). This phase of the study will also identify the operational concepts for the delivery of medical care to the nuclear casualties.

Phase 4: Identify and quantify the shortfalls between resources required and resources available to manage nuclear casualties.

Phase 5: Identify alternatives to the existing military health care system to remedy the shortfalls between requirements and available capabilities to medically manage nuclear casualties. Recommend the optimum strategies for the management of nuclear casualties within the proposed revisions to the military health care system.

A. Phase 0 – Definition and Implementation of the Study Parameters

1. Objective

Establish the scope of the study, to include the range of issues to be considered outside the realm of military medical management. Define the baseline scenario and associated parameters of interest, the considered casualty types, the range of variations, and the measures of effectiveness necessary to both quantify capability shortfalls and evaluate possible remedies. Identify and select appropriate tools and methodologies for use in the conduct of the study, and develop a strategy to overcome existing limitations of those tools and methodologies. Determine data requirements and develop a data collection plan to support each subsequent phase of the study.

2. Study Approach

- Prior to initiating any subsequent phase of this study, the WG must translate the guidance provided in the Study Charter to the specific parameters defining the scope and areas of interest to the study. This includes establishing the terms of reference (TOR) for the study, agreeing upon a baseline scenario and excursions, the degree of variation to be investigated in the sensitivity analysis, and the measures of effectiveness (MOEs) used to assess capability shortfalls and possible remedies.
- A nuclear detonation will create issues and problems for medical management that cannot be addressed within the military medical community alone. These include interactions between the US military, its allies, and host nation governments; interactions between the U.S. military and other departments of the U.S. government, such as the DOS; and interactions between the military medical assets and other component parts of the U.S. military force. The WG must decide which of these issues will be addressed in the course of the study, and which will remain outside its scope.
- At the same time, the study performers must identify the tools and methodologies they will use to conduct required analysis. To the extent that available tools and methodologies are inadequate, the performers must develop a plan for modifying or further developing those tools, within the constraints of study resources and milestones. If

this is not feasible, the study performers should recommend a course of action for meeting study objectives in the absence of required tools and methodologies.

- As part of their identification of tools and methodologies, the performers should identify available nuclear effects models and determine which is most applicable. The selection of an effects model will be driven by the extent to which its outputs are consistent with the degree of fidelity needed to assess the effects of the detonation on the population.
- Each phase of the study will require data. The performers should identify data requirements associated with each phase. They should also identify prospective data sources and develop a plan to acquire it as needed.
- Assess the applicability and limitations of existing military medical management requirements data, as embodied in the CUD, *Treatment of Nuclear and Radiological Casualties* (FM 4-02.283), the Task-Time-Treater Files (TTTF), and other pertinent references.
- The principal product will be the study TOR (the specific statement of the study participants, scope, study questions, timelines, etc., implementing the study plan), description of the baseline scenario and excursions, analytical parameters, and MOEs.

3. Milestone Product(s)

- **Milestone 0** – Establish the study TOR, the baseline scenario and excursions, the degree of variation to be investigated in the sensitivity analysis, and the MOEs to be used to optimize the medical management of nuclear casualties. Determine the desired values for threat parameters of interest, including yield, height of burst, meteorology, etc. Identify and select appropriate tools and methodologies for use in the conduct of the study.

Product – “The Terms of Reference for a Study on the Medical Management of Nuclear Casualties within the U.S. Military Health Care System”

Product – “Nuclear Effects Models for the Study of the Medical Management of Nuclear Casualties within the U.S. Military Health Care System”

Product – “Data Requirements for the Study of the Medical Management of Nuclear Casualties within the U.S. Military Health Care System”

4. Timelines (times expressed as duration of effort within each milestone)

This phase of the study must be largely complete prior to the beginning of any subsequent phases of the study.

- **Milestone 0** – 3 months

5. Resources

- **Milestone 0** – 9 person-months of effort

B. Phase 1 – Determination of Casualty Stream

1. Objective

Using appropriate nuclear effects and population models (as identified in Phase 0), estimate expected casualties for the baseline scenario and various excursions. This estimate would include the number and locations of casualties and the distribution of injuries by type. It would also include an estimate of the disposition of those casualties over time, to include the extent to which their condition would degrade prior to the initiation of treatment.

2. Discussion

The proposed study is expected to exploit the emerging understanding of nuclear effects to estimate how many casualties with various injury types should be expected among an exposed military population. Historically, an inability to account for many of the factors unique to an urban nuclear detonation has resulted in casualty estimates that are inadequate for use in the more complex environments in which nuclear warfare poses a threat. As a result, estimates of the number and types of casualties resulting from a nuclear attack that are based on methodologies with these limitations are outdated and insufficient for today's military planners. However, recent advances in modeling now allow for the development of more credible estimates of nuclear casualty types. Psychological impact, glass breakage, building collapse, radiation absorption by buildings, and blast and thermal reflection are among the latest effects being modeled, but not all of them have been used for military planning.

3. Study Approach

- Identify the population at risk in the baseline scenario. This includes the number of U.S. military personnel, dependents, U.S. civilians, and host nation support personnel in the immediate vicinity of the detonation. It also includes host nation civilians that would be affected by the detonation, both promptly and over time.
- Identify the terrain, buildings, roads, and other features within the area affected by the detonation. Review existing models for estimating the ways in which urban terrain features mitigate or exacerbate the casualty-producing effects of a nuclear detonation and determine the extent to which these models can and should be applied in this phase of the study. Following this review and as required, determine the location and disposition of individuals at the time of the detonation, to include whether or not they are in buildings, in the open, or in vehicles.

- Use identified models and collected data to calculate the effects experienced by individuals within the population at risk. Given these effects, determine the distribution of injuries by type and over time in the absence of treatment.
- Produce a listing of expected U.S. military casualties, by type and number, together with their disposition over time in the absence of treatment. The outputs of this phase serve primarily as inputs to subsequent phases.
- Produce a listing of all expected casualties by type within the region, to include host nation and Allied civilians. The purpose of this estimate is to promote an increased understanding of the broader context within which medical management of U.S. military casualties will occur.
- Conduct a series of sensitivity analyses to determine the extent to which the number of casualties by type will change given changes to threat parameters such as yield, height of burst, and meteorology. The sensitivity analyses will include consideration of alternative attack locations at other targets that would result in U.S. military casualties within the combatant command area of responsibility.

4. Milestone Product(s)

- **Milestone 1.1** – Military casualties resulting from a nuclear detonation occurring in the vicinity of U.S. military forces deployed overseas.

Product – “Report on the Expected Number and Types of Military Nuclear Casualties”

- **Milestone 1.2** – Sensitivity of casualty estimate to variations in yield, height of burst, and point of detonation in the vicinity of U.S. military forces deployed overseas.

Product – “Report on the Sensitivity of Nuclear Casualty Estimates to Variations in Threat Parameters”

5. Timelines (times expressed as duration of effort within each milestone)

- **Milestone 1.1** – 8 months
- **Milestone 1.2** – 9 months

6. Resources

- **Milestone 1.1** – 18 person-months of effort
- **Milestone 1.2** – 18 person-months of effort

C. Phase 2 – Estimation of Required Medical Management Capabilities

1. Objective

Using the CUD (or an equivalent resource) supplemented by subject matter experts, define the capabilities required to collect, evacuate, decontaminate, triage, stabilize, and treat each type of nuclear casualty across all levels of military medical treatment, from initial reception into the military health care system through the point of patient recovery, including the associated medical logistics. Stratify casualties according to the medical capabilities needed to manage nuclear casualties.

2. Discussion

The data embedded in current medical management logistical models are limited in scope. Although the requirements for managing many nuclear casualty types are very well described up to a certain level of medical care, the medical resources required beyond that level are unspecified. There are some casualty types, however, that are not addressed in existing models; the requirements for managing these patients will need to be incorporated as well. It may be particularly difficult to determine the medical resources necessary to manage patients with combined injuries because the synergistic effects of conventional burns and trauma and radiation injuries are not easily predicted. Addressing these issues in this study will likely result in recommendations for significant revisions to existing or proposed logistical models.

3. Study Approach

- Document the current concept of operations for the execution of military medical capabilities, including casualty collection, evacuation, decontamination, triage, stabilization, and treat treatment. Identify the resources needed to support these capabilities beyond those delineated for treatment of specific nuclear casualty types.
- Identify gaps between injury types specified in Phase 1 and medical management requirement data currently available. Two kinds of gaps are anticipated: the types of injuries described in existing medical management models will not represent all anticipated types, and the duration of medical management requirements will extend beyond the term those models currently consider. Develop and execute a strategy for filling those gaps with the best available data to determine comprehensive requirements for medical management of all types of injury identified in Phase 1 through patient recovery, to include personnel, equipment, consumables, facilities, and transportation requirements.

4. Milestone Product(s)

- **Milestone 2.1** – Review of existing medical management requirements data.

Product – “Report on Efforts to Fill or Manage Identified Gaps in Existing Medical Management Data”

- **Milestone 2.2** – Identification of short-term medical management requirements for victims of a nuclear detonation.

Product – “Report of Medical Management Requirements through Day 3 Following a Nuclear Detonation”

- **Milestone 2.3** – Identification of long-term medical management requirements for victims of a nuclear detonation.

Product – “Report of Medical Management Requirements from Day 3 through Patient Recovery Following a Nuclear Detonation”

5. Timelines (times expressed as duration of effort within each milestone)

- **Milestone 2.1** – 5 month
- **Milestone 2.2** – 9 months
- **Milestone 2.3** – 9 months

6. Resources

- **Milestone 2.1** – 8 person-months of effort
- **Milestone 2.2** – 18 person-months of effort
- **Milestone 2.3** – 18 person-months of effort

D. Phase 3 – Definition of Available Medical Management Capabilities

1. Objective

From the current deployment of military medical management capabilities and facilities, identify and quantify the resources that would be available to address the medical management requirements for nuclear casualties. Include all levels of the military health care system, from initial reception through patient recovery. Response times for individual assets will need to be defined (perhaps as a function of the unit missions, the available mobility or evacuation resources, and the anticipated infrastructure damage). This phase of the study will also identify the operational concepts for the delivery of medical care to the nuclear casualties.

2. Discussion

The difficulty of estimating available capabilities should not be underestimated. The challenge of identifying the specific medical assets available at all levels/echelons/roles is complicated by constraints in the operational environment and competition for resources from

other sources. Local medical facilities may be inaccessible, and will almost certainly be inadequate. Estimation of the number and type of medical resources available must consider the impact of infrastructure damage and collateral civilian casualties on the delivery of medical care, logistics support, and patient movement within the host nation. The study performers will need to identify the assets available for first response, stabilization, evacuation, and definitive treatment, and the time frames post-detonation that these assets become available. Response times for individual assets may be regarded as a function of the unit missions, the available mobility or evacuation resources, and the anticipated infrastructure damage.

Once available assets are identified, they must be further categorized by their current or anticipated capacity and capability to manage nuclear casualties. Capabilities should be defined in terms parallel with the medical requirements identified above, and must include the physical assets such as medical personnel by specialty, consumable supplies (including vendor managed inventory and surge production capabilities), durable medical equipment, and hospital beds by type, as well as the logistical processes that ensure that these resources are allocated fairly and efficiently. The availability of medical materiel should be stratified and prioritized according to the requirements for management of nuclear casualties.

3. Study Approach

- For the baseline scenario and excursions, identify the U.S. military medical management resources within the host nation or in the region of the detonation. These constitute capabilities assumed to be available within the first 24 hours after the nuclear detonation (alternative assumptions about response times or response areas may be appropriate). Assumptions on the time of availability of response capabilities are highly dependent on other assumptions about the condition of transportation infrastructure and command and control of the available capabilities. This description should include detailed capabilities specific to all U.S. military medical assets within the host nation, identified by unit and location.
- Identify the U.S. military medical management resources within combatant command areas of responsibility. These constitute capabilities assumed to be available within the first 24–72 hours after the nuclear detonation.
- Identify the U.S. military medical management resources within the continental United States (CONUS). These constitute capabilities assumed to be available beginning three days after the nuclear detonation, and comprise the majority of the definitive care and convalescent resources available.
- The principal product will be a matrix of medical management capabilities identified by time of availability, facility type, location and accessibility, specifying the detailed capacity within consumable supplies, durable medical equipment, bed types, personnel (by medical specialties), mobility, evacuation and decontamination assets.

4. Milestone Product(s)

- **Milestone 3.1** – Nuclear casualty medical management capabilities within a 24–72 hour response period around overseas military populations at risk of nuclear attack.

Product – “Report on U.S. Military Nuclear Casualty Medical Management Capabilities within Host Nations or in the Region of the Detonation”

- **Milestone 3.2** – Nuclear casualty medical management capabilities within regional combatant commands with overseas military populations at risk of nuclear attack.

Product – “Report on U.S. Military Nuclear Casualty Medical Management Capabilities within the Regional Combatant Commands”

- **Milestone 3.3** – Nuclear casualty medical management capabilities available outside of a combatant command area of responsibility.

Product – “Report on U.S. Military Nuclear Casualty Medical Management Capabilities within CONUS”

Product – “Integrated U.S. Military Nuclear Casualty Medical Management Capability Matrix”

- **Milestone 3.4** – Sensitivity of available capabilities to variation in scenario parameters.

Product – “Report on the Sensitivity of Nuclear Medical Management Capabilities to Variations in Scenario Parameters”

5. Timelines (times expressed as duration of effort within each milestone)

- **Milestone 3.1** – 9 months
- **Milestone 3.2** – 12 months
- **Milestone 3.3** – 12 months
- **Milestone 3.4** – 12 months

6. Resources

- **Milestone 3.1** – 12 person-months of effort
- **Milestone 3.2** – 9 person-months of effort
- **Milestone 3.3** – 12 person-months of effort
- **Milestone 3.4** – 12 person-months of effort

E. Phase 4 – Identification of Medical Management Shortfalls

1. Objective

Identify and quantify the shortfalls between resources required and resources available to manage nuclear casualties.

2. Discussion

There are many uncertainties regarding the ability of the U.S. military system to manage the medical response to a nuclear detonation overseas. For example, what are the major chokepoints hindering medical management? Is the major medical management shortfall the inability to triage effectively or to connect patients to resources? What nonmedical support is required for the effective medical management of nuclear casualties? Is it a shortage of facilities, personnel, or supplies? Are there certain assets that are the limiting resources? Will shortages necessitate the immediate implementation of crisis standards of care or can routine healthcare be provided for hours, days, or even weeks at certain locations? How might a change in the standard of care affect the military's ability to provide required capabilities?

3. Study Approach

- The combination of the products of Phase 1 and Phase 2 of this study identify and quantify the total U.S. military requirements for casualty management, given a nuclear attack against a military installation overseas. Phase 3 identifies and quantifies the U.S. military capability to provide medical treatment to nuclear casualties. Phase 4 of this study compares and analyzes the resources available with respect to the resources required, identifying shortfalls and the impact of shortfalls on patient care. This should include, as a minimum, detailed descriptions of the shortfalls, specific to the type of casualty being treated, the specific medical requirement that is inadequately supported, and the time frame within which the shortfall occurs. Medical management capabilities that are used to assign available resources to specific casualty types or treatment protocols should be specified in this analysis.
- The principal product will be a multidimensional matrix specifying the detailed medical shortfalls by type of nuclear casualty, facility type, type of medical capability or resource that is inadequate to the requirement, and the time the shortfall would be expected.

4. Milestone Product(s)

- **Milestone 4.1** – Initial analysis and estimate of shortfalls between required and available U.S. military medical management capabilities.

Product – “Report on the Comparison of U.S. Military Nuclear Casualty Medical Management Requirements against Available U.S. Military Medical Management Capabilities for the Scenarios Examined”

Product – “Report on the Nonmedical Support Required for the Medical Management of Nuclear Casualties”

5. Timelines (times expressed as duration of effort within each milestone)

This phase of the study cannot begin until the first three phases are essentially complete.

- **Milestone 4.1** – 9 months

6. Resources

- **Milestone 4.1** – 24 person-months of effort

F. Phase 5 – Recommendations for Remediation of Medical Shortfalls

1. Objective

Identify alternatives to the existing military health care system to remedy the shortfalls between requirements and available capabilities to medically manage nuclear casualties. Recommend the optimum strategies for the management of nuclear casualties within the proposed revisions to the military health care system.

2. Discussion

Ultimately, the issue to be resolved by this study is the shortfall between the requirements and capabilities for medical management of nuclear casualties. Remedies for the shortfall should clearly address a wide range of operational considerations: the goals and objectives of the response; the strategies, tactics, policies, and constraints affecting the response; the organizations, activities, and interactions among participants and stakeholders; the specific operational processes needed for the response; and the conditions and processes for initiating, developing, and sustaining the response. In other words, the remedies should fully address the nuclear medical CONOPs. Is the nuclear medical CONOPs clear and appropriate to optimize the medical management of nuclear casualties? If not, then strategies to reallocate or augment existing resources should be proposed within the existing medical response system. If recommendations to address shortfalls within the existing military health care system fall short of reaching this goal, then inefficient doctrine, plans, protocols, and practices should be called out. Remedies should be recommended, highlighting the changes to doctrine, organization, training, materiel, leadership and education, personnel, and facilities that would allow for the most effective response.

Further, any recommendations need to be balanced against the other priorities of the DOD. A nuclear attack against U.S. military forces is generally regarded as a “low probability – high consequence” event. The previous phases of this study focused on the “high consequence” component of this characterization. The “low probability” component will become significant as decisions are made as to which actions to recommend, and which of those to implement, to improve DOD’s abilities for nuclear medical management. Any recommendation made from this study will have to be considered against the priorities of other, “high probability – lower consequence” events. Changes to the military health care system to improve nuclear medical management should not compromise the existing capabilities to respond to conventional casualties.

3. Study Approach

The product of Phase 4 of this study is an estimate of the shortfalls for providing medical care to U.S. military nuclear casualties in the environment of patient care capabilities as they currently exist. Phase 5 identifies the optimum strategies for the management of nuclear casualties within the existing military health care system, and recommends changes to the existing military health care system which remedy the identified shortfalls, to the extent possible. Phase 5 further recommends the development of, or revisions to, the nuclear medical management CONOPs. Recommended remedies should specify the changes to doctrine, organization, training, materiel, leadership and education, personnel, and facilities that would allow for the most effective response. The final product of this study should be a prescription for medical readiness that optimizes the care of a nuclear casualty within a robust nuclear medical management CONOPs and the DOTMLPF changes to the military health care system that execute and support this CONOPs.

4. Milestone Product(s)

- **Milestone 5.1** – Development of medical management strategies for providing patient care in the resource environment following the detonation of a nuclear weapon against U.S. military forces overseas.

Product – “Report on a Strategy for the Optimization of Medical Management of Nuclear Casualties within the U.S. Military Health Care System”

- **Milestone 5.2** – Final recommendations of changes within the DOTMLPF rubric.

Product – “Recommendation on the Concept of Operations and Changes in the Military Health Care System to Address Shortfalls in the Medical Management of U.S. Military Nuclear Casualties”

5. Timelines (times expressed as duration of effort within each milestone)

This phase of the study cannot begin until Phase 4 is complete. From the completion of Phase 4, this phase is estimated to require 9 months.

- **Milestone 5.1** – 6 months
- **Milestone 5.2** – 3 months

6. Resources

- **Milestone 5.1** – 24 person-months of effort
- **Milestone 5.2** – 9 person-months of effort

7. Schedule

This study can be performed in as little as three years, by overlapping the efforts for multiple phases. Phases 1–3 can be executed concurrently within the first eighteen months of the study (with some interdependence of the effort from one phase on the products of another). Phases 4–5 can be executed consecutively within the subsequent eighteen months of the study. Figure 2 depicts the proposed study schedule and level of effort expected to complete each milestone.

- **Phase 0** – Months 1–3 of the study
- **Phase 1** – Months 3–18 of the study
- **Phase 2** – Months 3–18 of the study
- **Phase 3** – Months 3–20 of the study
- **Phase 4** – Months 19–27 of the study
- **Phase 5** – Months 28–36 of the study

Study Phase	Study Year 1												Study Year 2												Study Year 3														
Milestones	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36			
0	9 Person-Months																																						
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3.4										12 Person-Months																													
4.1																		24 Person-Months																					
5.1																											24 Person-Months												
5.2																																				9 Person-Months			

Figure 2. Study Plan Schedule and Level of Effort

8. Products

The final product of this study is a report on the “Recommendation on Changes in the Military Health Care System to Address Shortfalls in the Medical Management of U.S. Military Nuclear Casualties.”

The study plan provides for extensive documentation of all work conducted under its auspices. Each phase (and in most cases, each milestone) would result in a publication or analytical tool as a product. Among these, the primary products are:

- “Report on the Expected Number and Types of Military Nuclear Casualties”
- “Report of Treatment Requirements from Day 1 through Patient Recovery Following a Nuclear Detonation”
- “Integrated U.S. Military Nuclear Casualty Medical Management Capability Matrix”
- “Report on a Strategy for the Optimization of Medical Management of Nuclear Casualties with the U.S. Military Health Care System”

9. Resources

This study is estimated to cost \$4.9M over three years of effort. By year of effort, this is:

- Year 1 \$2.3M
- Year 2 \$1.6M
- Year 3 \$1.0M

The original initiative for this study, and the total funding for this report, comes from the U.S. Army Office of the Surgeon General. Given the relatively large cost of executing the proposed study, IDA recommends that resources for the performance of this study be provided by (and shared among) the DOD and Military Service activities most involved in the planning, preparation, and delivery of medical care for nuclear casualties.

Appendix A

Illustrations

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Appendix B

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Appendix C

Abbreviations

AFRRI	Armed Forces Radiobiology Research Institute
CBRN	Chemical, Biological, Radiological, and Nuclear
CENTCOM	U.S. Central Command
COCOM	Combatant Command
CONOP	Concept of Operation
CONUS	Continental United States
CUD	Command User Database
DMMPO	Defense Medical Materiel Program Office
DOD	U.S. Department of Defense
DOS	U.S. Department of State
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities
DTIC	Defense Technical Information Center
DTRA	Defense Threat Reduction Agency
EUCOM	U.S. European Command
FY	Fiscal Year
GOSC	General Officer Steering Committee
HPAC	Hazard Prediction and Assessment Capability
JWICS	Joint Worldwide Intelligence Communications System
MOE	Measure of Effectiveness
NBC CREST	Nuclear, Biological, and Chemical Casualty and Resource Estimation Support Tool
OTSG	U.S. Army Office of the Surgeon General
PACOM	U.S. Pacific Command
TOR	Terms of Reference
TRANSCOM	U.S. Transportation Command
TTTF	Task-Time-Treater File
USUHS	Uniformed Services University of Health Sciences
WG	Working Group

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14. ABSTRACT This document proposes a study to assess the capabilities of the U.S. military health care system to meet the medical management requirements that would result from the use of a nuclear weapon against U.S. military forces in a foreign theater of war. The proposed study would provide policy makers and planners with recommendations to address shortfalls and utilize the optimum strategies for the management of nuclear casualties. The study concept is to identify both the required and available capabilities to manage the patient stream resulting from a nuclear attack, to determine at what point the required capabilities exceed those available, and to quantify and narrow the gap between the two cases. Capability includes both medical resources (e.g., supplies, equipment, and personnel) and the processes by which those resources are brought to bear. The study plan considers medical management capabilities to include, at minimum, those needed for the collection, evacuation, decontamination, triage, stabilization, and treatment of casualties, as well as the associated medical logistics.					
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